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ABSTRACT

There is no one structural model that defines the construct functional literacy. However, acceptable construct definitions in the literature cumulatively form some beginnings for a nomological network that relates functional literacy to the level of skills deemed necessary for survival in society. In the study, two different validation methodologies were applied to address the problem of construct interpretations of a set of test scores obtained from the Florida Functional Literacy Test. The first design utilized socioeconomic variables to establish criterion groups. In the second correlation approach, concurrent validity of the literacy test was studied by correlating literacy test scores with test scores obtained from a cloze reading test. Results from the study provided some evidence for the tenability of a hypothesized relationship between performance on the functional literacy test and level of functioning in society. (Author/GK)

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An Investigation of the Relationship Between A Measure of Functional Literacy and Level of Functioning in Society

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Abstract

There is no one structural model that defines the construct, functional literacy. However, acceptable construct definitions in the literature cumulatively form some beginnings for a nomological network that relates functional literacy to the level of skills deemed necessary for survival in society. In the study, two different validation methodologies were applied to address the problem of construct interpretations of a set of test scores obtained from the (formerly-called) Florida Functional Literacy Test. The first design utilized socio-economic variables (income, education, occupation) to establish criterion groups. In the second correlation approach, concurrent validity of the literacy test was studied by correlating literacy test scores with test scores obtained from a cloze reading test. Results from the study provided some evidence for the tenability of a hypothesized relationship between performance on the functional literacy test and level of functioning in society.

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An Investigation of the Relationship Between A Measure of Functional Literacy and Level of Functioning in Society

The construct definition is the initial element in the construct validation of instruments (Campbell and Fiske, 1959; Cronbach, 1971). While no one definition of the "functional literacy" construct has received consensus, authorities emphasize the performance of reading tasks directly related to practical real-life experiences (e.g., Kirsch and Guthrie, 1977; Bormuth, 1977). The problem of literacy in the United States is "one of assuring that every person arriving at adulthood will be able to read and understand the whole spectrum of printed materials that one is likely to encounter in daily life" (Carroll and Chall, 1975). Some researchers have incorporated a much wider range of human competencies beyond the printed language (HEW, 1953; Northcutt, Shelton, and Nyer, 1975). Extensions of the construct have included reading, writing, and computational skills (National Reading Center, 1971; Karlsen, 1973; Sticht, 1975). The definition provided by UNESCO, probably the most widely used, defined the content of the Florida Functional Literacy Test used in the present study. The definition is quoted below:

> A person is literate when he has acquired the essential knowledge and skills which enable him to engage in all those activities in which literacy is required for effective functioning in his group and community, and whose attainments in reading, writing, and arithmetic make it possible for him to continue to use these skills toward his own and the community's development. (Harman, 1970)

The acceptable definitions of functional literacy cumulatively form some beginnings toward a network that relates functional literacy to the level of skills deemed necessary for survival in society (Kirsch and Guthrie, 1977). One might find it reasonable to hypothesize that people with a limited command of skills as reading, writing, and operating with quantities would on the average have a lower level of functioning (or success) in our society. Such limited skills might be useful to explain part of the variance in the level of functioning. This theoretical idea has been used to "explain and organize" some beginnings for a network of relationships (Karlsen, B., 1964; Kirk, S. A., 1972). The attempts, then, are directed to find empirical support for such hypothesized relationships. Of course, evidence of construct validity is not found in a single study. Rather, judgments about construct validity are derived from an accumulation of research results (Standards, 1974).

The present study used the theoretical notions above to address construct validity issues related to the State Student Assessment Test, PartII the "functional literacy test."[1] Two correlational approaches were used to examine the relationships between performance on the literacy test and variance in levels of functioning. The first study employs a criterion-group design, where level of functioning is defined in terms of education and income level. In the second study a concurrent validity approach was used. For this design a reading comprehension test of materials encountered in real life situations was correlated with the functional literacy test. Levels of literacy (or functioning) were defined by the different levels of difficulty of the reading tasks. A detailed description of each approach and the results follow.

[1]Originally the State Student Assessment Test, Part II, was referred to as the Florida Functional Literacy Test, administered in its initial form to about 120,000 eleventh graders in 1977. See "The Courts and your Minimum Competency Testing Program- A Guide to Survival by T. H. Fishcer in NCME, Vol.11, no.1, Fall, 1980.

Validity Study I: Criterion - Group Design

There are any number of ways one might operationalize levels of literacy. Years spent in school, grade-level equivalent scores derived from verbal aptitude tests, and socio-economic indices have traditionally been noted as indicators of required skills for functioning in society. The view of functional literacy presented here is not an either/or proposition. There are various levels of literacy. Borrowing from others (see e.g., Northcutt, et al) we operationally defined literacy in this study in terms of education and socio-economic level as indicated by family income.[1] It was hypothesized for the first study that test scores on the Florida Functional Literacy Test were related or parallel to levels of income and education.

To study the test in this paradigm, the criterion-group design was used. The design identifies a group at or above a minimum competency level and one below that level (Fremer and Dwyer, 1977). In this study three criterion groups were identified by using what seemed to be adequate criteria formulated in the Adult Performance Level (APL) Project (Northcutt, et al., 1975). In that design functional literacy was perceived as being continuously distributed with

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[1] Job status was originally built into the design. However, too many subjects turned out to be in unclassifiable categories, and so job status was not considered in the final analysis.

points along the scale representing different levels of functioning (Kirsch and Guthrie, 1977). It was reasoned that since functional literacy is determined by societal demands, the criterion groups could meaningfully be formed by the use of socio-economic indicators in society. Their normative strategy for identifying three groups of adult functioning were: (1) adults who function with difficulty and are characterized by poverty income, unemployment or low job status, and eight or fewer years of formal education, (2) functional adults characterized by income greater than poverty level, medial job status, and 9-11 years of education, and (3) proficient adults characterized by high income, high job status, and minimum education of 12 years or more.

According to the definition coined by the Florida Department of Education: "Functional literacy is the satisfactory application of basic skills in reading, writing, and arithmetic to programs and tasks of a practical nature as encountered in everyday life." The test was the original test administered to 11th graders as part of the 1977-78 Florida Statewide Assessment Program. There were 59 math items and 58 communication items. The respective item sets represented 13 math and 11 communications minimal performance standards. At the time of this study, passing meant answering at least 70% of the items correctly and obtaining mastery on 50% of the individual minimum student performance standards. This meant, for example, that a minimum of 42 of the 59 math items had to be answered correctly. At the same time, it was necessary that those items covered at least 7 of the 13 math performance standards. A student passed the math portion by satisfaction of both conditions. Coefficient alphas based on the study's sample were .96 and .98 for each section, respectively. The authors recognized the high estimates were influenced to some extent by an

intentional selection of a heterogeneous sample.

Sample

To implement the design, 448 subjects from 9 different settings in Florida were selected. Eight of the groups were adults who were in educational settings, including adult basic education classes, adult secondary education classes, and community college students. The ninth group was composed of adults tested in an employment setting. This last group ranged from secretaries to high level administrators. Only 9% of the people tested were under age 18.

The limits on the criterion groups for the present study were the following:

Group A. $5,000 or less annual family income and eight years or less of of education (n=40).

Group B. $5,000 to $14,000 incomes and nine to eleven years of education (n=75).

Group C. Over $14,000 income and 12 years or more of education (n=70).

Job status was eliminated as a third indicant. Too many subjects were either unemployed or they recorded insufficient information to permit their job to be classified according to the Duncan occupational scale (Robinson, Athanasion and Head, 1969).

The Florida Functional Literacy Test was administered to the entire sample. Table 1 reports the proportion passing each section of the test for the three criterion groups. A chi-square analysis showed statistical significance at the .01 alpha level. An ANOVA on the mean total scores for each section showed significant differences at the .01 level. Mean total scores are reported in Table 2.

---------- Insert Table 1----------

---------- Insert Table 2----------

Conclusions

It is evident from the results that the communications test score distribution was negatively skewed. This typified the results of the state as a whole. Other than that, the pattern was quite similar for the two domains. Individuals classified as functioning at a higher level in terms of education and income tended to obtain higher passing scores on both parts of the literacy test. The results supported a within-construct portion of the network for the construct.

Additional related evidence of the concurrent validity was gathered using these data.

Validity Study II: Concurrent Validity Design

The purposes of the second study were to assess the relationship of the communications score on this test to scores on a reading test constructed from materials that people may encounter in every day life and to estimate the level of reading comprehension represented by a passing score on the literacy test.

The reading test was one that had been developed for a Title IV-C project in order to assess the reading literacy needs of educable mentally retarded children (King, 1980). The set of operations used in test construction followed as closely as possible those recommended by Cronbach for the construction of domain-referenced tests (1971). These include defining the domain or universe of interest, specifying procedures for sampling the domain and for stimulus construction, planning the materials and instructions given to examinees, and formulating the rules by which responses are evaluated.

Definition of the literacy domain was attempted by building on the work of Hansen and Hesse (1974) and Finch (1977) who had defined a number of reading domains and categories in a study of the literacy of students in Madison, Wisconsin. Seventeen nonoverlapping literacy sub-domains had been identified, and four of them were selected for test development. A survey of teachers of educable mentally retarded children was used for this selection process.

The four sub-domains were money management, health, employment, and food purchasing and preparation. A large number of printed information-giving materials were collected for each of the four categories. Sources included government agencies, news media, commercial publishers, appliance manufacturers, medical and dental societies, drug companies, banks, and consumer organizations.

Random samples were taken from the collected materials and were key punched for determination of their reading difficulty levels through use of a computer program written for that purpose (King, 1980). Each sample was approximately 200 words in length. (Three samples were taken from materials having more than 60 pages of text, two samples were taken from texts having 20 to 60 pages and one sample was taken if the text had fewer than 20 pages).

The samples within each sub-domain were stratified into seven levels of difficulty, and the one nearest the mid-point of each interval was selected for use as a test passage. When two or more passages fell at the midpoint of a particular level, a random choice among them was made. A twenty item multiple choice cloze test was constructed for each test passage: Procedures followed were, in general, those outlined by O'Reilly, Shuder and Kidder (1976), who demonstrated the validity of such tests as measures of literal reading comprehension.

In accordance with the work of Bormuth, (1969, 1971), a minimum score of 75% (15 of 20 items) was taken as being the lowest comprehension level at which people can gain information from printed material. In the present study only the five most difficult test passages in each sub-domain were used. Thus, when test passages were scored according to the 75% criterion these scale scores could range from zero to five.

With the exception of one test site, the cloze tests were administered during the same sessions as was the literacy test. These four tests each containing five passages from one sub-domain, were distributed serially so that each subject received only one test. A total of 413 subjects were tested.

Results

As a first analysis, the test data for each sub-domain were subjected to a Guttman Scalogram analysis. Coefficients of reproducibility and scalability are presented in Table 3.

---------- Insert Table 3 ----------

These results indicate a high degree of probability that subjects passing at any given difficulty level would also pass at all lower levels. They also strongly indicate that once failure occurs at a given level, subjects are unlikely to pass on any higher level of difficulty.

In the second and subsequent analyses only the 75 subjects in group B of the previous study were used. Total cloze test scores were correlated with total correct scores on the Functional Literacy Test communications standard. The resulting correlation was .64, indicating that the communications standard total number right score corresponded moderately to the results obtained from a

separate and quite different measure of reading comprehension. The results added further support to the concurrent, or correlational validity of the communications standard scores.

The third analysis was conducted to determine the level of reading represented by the 70% cutting score on the communications standard. The procedure involved locating the score on the cloze scale that represented the point where the frequency distribution for the failing examinees in that group crossed the frequency distribution for the passing examinees (Guilford, 1956). The point identified was a scale score on the cloze test of slightly above 3.

A way to appreciate this level of reading competence is to consider the paragraphs that the subjects could read with minimal comprehension at this level. A part of one selection, for sample, was the following:

> The house fly is one of the most common pests found in the home. They breed and feed in garbage, human wastes and animal manure. If disease germs are in these materials the flies get them on their hairy legs and feet, then fly from these filthy places carrying the germs to your food. House flies have been found to be infected with 20 human diseases including typhoid fever, dysentery and a number of parasitic worms.

Most students who did not pass could not make sense of this selection.

Students who just met the passing standard, but with little margin to spare, i.e., who were at level three rather than level four or higher, could be expected to extract useful information only infrequently and with considerable difficulty passages at the next higher level. Those who failed would rarely be able to understand it.

An attempt was made to obtain an indication of how well persons attaining passing scores on the literacy test might be able to comprehend the whole group of sample passages from the four sub-domains. The number of passages with

difficulty levels four and above was divided by the total number of passages. It was found that individuals attaining passing scores could be expected to read with 75% comprehension approximately 48% of the passages. This indication is admittedly a rather rough one, but its implications for educators and also for those who write information giving materials for distribution to the general population should not be ignored.

Summary

The present study attempted to investigate construct and concurrent validity issues related to the Florida Functional Literacy Test. In doing so, the study utilized some theoretical notions that relate the functional literacy construct to different levels of functioning in society to hypothesize relationships about characteristics of those who achieve high and low scores on the test. Two approaches were used to consider the tenability of the relationships. In the first study, level of functioning was defined by criterion groups based on income and level of school. The second study viewed level of functioning (or literacy) in terms of the level of material that could be read by individuals at a particular score level on the functional literacy test. In both instances, empirical findings did provide some evidence for the tenability of relationships between performance on the literacy test and level of functioning. What this basically means is that the data behaved as expected, based on our hypothesized notions of the functional literacy construct.

It is useful to point out some delimitations we perceived in the validity designs. Two flaws in the criterion-group metholodogy were

recognized as being that (1) indirect rather than direct literacy criteria formed the basis for assignment of subjects into the criterion groups and (2) the types of materials literate persons can read remain unknown.

In an attempt to somewhat compensate for the limitations, a second approach was employed. In that approach, a domain-referenced reading cloze test identified specific information about the types of reading materials or level of literacy a person (at a particular level on the literacy test) would be able to read with a high probability of minimal comprehension. A moderately high correlation between literacy test scores and level of literacy was obtained. The results suggested that level of literacy or functioning (as measured in the present study) and performance on the literacy test are indicators of a similar underlying psychological construct--perhaps "functional literacy." In any event, since no single study is sufficient to claim construct validity of a given instrument, further investigations are in order.

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Table 1

Proportion Passing Mathematics Standard in Criterion Groups

Group	Proportion Passing
A	.05
B	.35
C	.77

Proportion Passing Communications Standard in Criterion Groups

Group	Proportion Passing
A	.30
B	.72
C	.87

Table 2

Means and Standard Deviations of
Total Correct Scores on Mathematics in Criterion Groups

Group	Mean Total Score	
	Mean	S.D.
A	18.8	11.3
B	34.3	12.7
C	46.7	13.2

Means and Standard Deviations of
Total Correct Scores on Communications in Criterion Groups

Group	Mean Total Score	
	Mean	S.D.
A	27.5	18.0
B	43.6	13.3
C	50.8	11.9

Table 3

Scalability Coefficients of Cloze Test Scores by Literacy Sub-Domains and Combined Sub-Domains

(75% Comprehension)

Sub-Domain	R	MMR	PI	CS	N
Employability Skills	.96	.73	.23	.86	76
Health	.93	.69	.24	.78	87
Money Management	.98	.79	.19	.90	100
Food Preparation	.96	.73	.22	.84	150
Combined Sub-Domain	.96	.73	.23	.85	413

R = Coefficient of Reproducibility
MMR = Minimum Marginal Reproducibility
PI = Percent Improvement (R-MMR)
CS = Percent of Scalability (PI + 1 - MMR)